

Claims

1. A transducer for a torque or force transducer comprising

a member having a region of magnetisable material to be subject to an applied stress due to torque or force

said region including first and second zones that are annular about an axis with said second zone located radially inward of said first zone,

one of said zones having a permanent magnetisation that is longitudinally oriented in the direction of said axis and the other zone providing a return flux path for flux generated by said one zone,

said one zone generating a magnetic field exteriorly of said region which has a magnetic field component in a circumferential direction with respect to said axis that is a function of the applied stress.

2. A transducer element as claimed in Claim 1 in which the exterior magnetic field generated by said one zone has a component in the axial direction usable as a reference.

3. A transducer element as claimed in Claim 1 or 2 in which said one zone extends to an annular surface of said member.

4. A transducer element as claimed in Claim 1, 2 or 3 in which said other zone has a permanent magnetisation that is longitudinally oriented in the direction of said

axis and that is of opposite polarity to the longitudinally magnetisation of said one zone.

5. A transducer element as claimed in any preceding claim in which said first and second zones constitute
5 said one and other zones respectively.

6. A transducer element as claimed in any preceding claim further comprising at least one further region of magnetic material adjacent the first-mentioned region, the or each further region including an annular zone of
10 permanent magnetisation.

7. A transducer element as claimed in Claim 6 in which said annular zone of the or each further region is longitudinally magnetised with a magnetisation of opposite polarity to said one zone.

15 8. A transducer element as claimed in any preceding claim in which said member is adapted to have torque applied thereto about said axis such that the circumferential magnetic field component is a function of torque.

20 9. A transducer element as claimed in Claim 8 in which said member is a cylindrical body, preferably circular cylindrical, mounted for having torque applied about its longitudinal axis.

25 10. A transducer comprising a transducer element as claimed in any preceding claim and at least one magnetic field sensor device disposed and oriented to detect the circumferential magnetic field component and provide a signal representing same.

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11. A transducer as claimed in Claim 10 further comprising at least one further magnetic field sensor device disposed and oriented to detect an exterior longitudinal field component generated by said one zone, said at least one further magnetic field sensor device providing a signal representing said longitudinal magnetic field component.

12. A transducer as claimed in Claim 11 comprising a signal processing circuit responsive to the respective signals representing the circumferential magnetic field component and the longitudinal magnetic field component to produce an output signal representing the circumferential field component referred to the longitudinal field component.

13. A transducer comprising a transducer element as claimed in Claim 2 or according to any one of Claims 3 to 9 dependent thereon, further comprising a first magnetic field sensor arrangement responsive to said circumferential magnetic field component to provide a first signal representing said applied stress, and a second magnetic field sensor arrangement responsive to said axial direction exterior component to provide a second, reference, signal, and signal processing means responsive to said first and second signals to produce, with reference to said second signal, an output signal representing said applied stress.

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